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BOOK REVIEWS

Measurement of Two-Phase-Flow Parameters. G. F. HEWITT, Academic Press, New York (1978), 287pp.

THERE is a slander about Professors which says that, if some of them have no knowledge about a certain scientific field, or very little, they deliver a lecture or write a book so as to become familiar with the subject. G. F. Hewitt is (unfortunately in respect of his didactic abilities) not a Professor; and certainly not in this regard. He is, rather, an outstanding and internationally known expert in the field of two-phase flow-measuring techniques, thanks to his great experience as leader of the Harwell Laboratories for many years.

The development and handling of reliable, exact and informative measurement techniques in the field of fluid dynamics requires great experience and experimental aptitude. These difficulties are raised to a higher power when the fluid is a multiphase one, like a gas–liquid mixture. G. F. Hewitt has not presented only his own experience and that of the Harwell group; he has collected much information and know-how from all over the world. This is made evident by the more than one thousand references included in the book.

The book not only gives an outstanding survey of modern measuring techniques for gas–liquid-flow developed throughout the world; and it also provides an introduction to experimental practice; and it provides a mass of valuable knowledge gained by using the described methods.

It is especially advantageous for the reader and user of this book that the chapters are not arranged according to special measuring techniques or instruments; instead the interesting variables to be measured, i.e. the two-phase flow parameters, serve as a key for organizing the book. For this to be done it was necessary, first of all, to classify these parameters. The author did this by distinguishing the importance of the variables to be measured. First priority was given to all parameters interesting to designers, such as pressure drop, heat and mass transfer, quality and mass flow. Steady-state as well as transient conditions were included in this deliberation. Parameters of the second and third order (such as flow distribution, flow pattern, droplet- or bubble-spectrum and entrainment) provide information leading to a better understanding of the primary parameters and help to evolve more physically significant mathematical models.

The emphasis of the presentation lies not in the description of conventional measuring techniques used for many years, but in the conveying of fundamental know-how about new and advanced methods. In addition, electrical and optical equipment and probes are dealt with in detail.

The book can claim, with good reason, to expound extensively, and mostly in an up-to-date and technically advanced manner, the modern developments in the field of two-phase flow measuring techniques. The know-how collected here will hardly be found, in this concentration, in another book. This is also the reason why the book does not aim to give detailed advice like a manual; but rather to be a guide, presenting the methods and guiding the reader. On the other hand, not only measuring techniques and their applications are described in an easily understandable and compact way, but also a critical analysis is made of the results gained with these techniques; and an interpretation is given with respect to the comprehension and theoretical description of the fluid dynamic phenomena. The limitations of using measuring techniques, and of their accuracy, are clearly demonstrated.

The book indeed is addressed primarily to experimentalists in research laboratories; however, it is also of great interest to, and an excellent help for, engineers and physicists in industry engaged in design and operation of apparatus and plants working under two-phase-flow conditions. It helps the researcher in designing his test rigs and in planning his experiments. The practical expert can deduce from the book valuable and precise hints for his tasks in calculating the fluid dynamic layout and for two-phase heat and mass transfer.

F. MAYINGER

Aerodynamic Heating and Thermal Protection Systems. LEROY S. FLETCHER, ed., Vol. 59 of Progress in Astronautics & Aeronautics, Series Editor-in-Chief, Martin Summerfield, AIAA, New York (1978), 424pp.

THE PAPERS that go together to make up this book have been drawn from two AIAA Meetings held in January 1977 (15th Aerospace Science Meeting, Los Angeles, California) and in June of the same year (12th Thermophysics Conference, Albuquerque, New Mexico), and have been, in the Editor's words "revised and updated especially for this volume". The copyright date of the book is 1978.

The book is divided into three main chapters with the titles Aerothermal Environment, Plume Radiation and Thermal Protection Systems. Thus, the eight papers contained in the first chapter are concerned with aspects of fluid motion and convective heat transfer as they arise in such situations as, for example, entry into planetary atmospheres, as well as the kind of flow fields encountered in the base regions of vehicles and the complex shape of the Space Shuttle in its launch configuration. One topic discussed here is the production of vortices in wakes or shear layers that impinge upon a body; such flows are also encountered near the base of buildings in the earth's boundary layer and the fact serves to remind one of the breadth of applications of studies in fluid mechanics and how one field can profit from studies in another.

The second chapter has three papers that deal with both calculations and measurement of infrared radiation from rocket exhaust plumes and with estimations of radiance and transmission from water vapour and carbon dioxide.

Finally, ten papers go to make up Chapter 3; they deal, in general terms, with ablation problems. This chapter has a substantial content of experimental work, but it begins with a fairly lengthy discussion of theoretical estimates of melt-through phenomena in metal plates subjected to tangential air flow. The subject has obvious applications to the matter of atmospheric re-entry, but it clearly has significance in other fields too.

Indeed, application to other fields than space flight is a theme that is explicitly mentioned by the editor in his Preface when he remarks that thermophysics (or what one might perhaps call more-than-usually-complicated heat transfer) is a science that is finding increasing application in pollution studies and in energy collection, conversion and storage. Not all of the papers that go to make up the book are immediately assessable as having significance outside their own (important) field of study; some are, of course, but it is easy to see how the expertise that is represented here is capable of solving the types of problems just described.

The book itself is nicely produced, despite its necessarily rather fragmented structure. There is a fair uniformity in the typefaces used for each paper, above all it is legible, and even the photographs have been well-enough reproduced to be informative (not always the case these days). Such books are